Chemical Analysis of Fig Transplants Cv Wazeri Under With Cutting Type and Humic Acid

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M. H. I. Alani[1], A. F. Z. Al-Dulaimy[1*], Y. S. Sekhi[1], A. F. Almehemdi[2]

Department of Horticulture and Landscape Gardening, College of Agriculture, University of Anbar, Iraq[1]
Center of Desert Studies, University of Anbar, Iraq[2]

[*]Corresponding author's e-mail: ag.ahmed.fatkhan@uoanbar.edu.iq

Abstract. Lath house trial was laid out at dept of horticulture and landscape gardening, college of agriculture, university of anbar, IRAQ to know Effects of cutting type and humic acid fertilizing on Wazeri fig transplants . Factorial experiment was done using random complete block design RCBD (3x3) with three replicates as three cuttings per experimental unit. during the growing season 2018. Cuttings have been cultured on Jan. 20th, 2018 and then humic was applied to culture media on the following times (Apr. 20th, Jul. 20th and Oct. 20th). Results revealed that All the studied traits have shown significant effect using different types of stem cuttings included (leaf chlorophyll content, branches carbohydrates content and leaf Nitrogen, phosphor and potassium content reached to (249.6 mg.100g^{-1}, 11.73%, 2.58%, 0.75% and 1.44%), respectively. effect of humic fertilization reached significant level of effect for all the studied traits except (leaf phosphorus content) especially(4ml.L^{-1}) Gave the highest results (350.1mg.gm^{-1}, 12.00%, 2.56% and 1.43%) for the traits (leaf chlorophyll content, branch carbohydrates content and leaf Nitrogen and potassium content, respectively. The interaction between both studied factors achieved a significant level in most studied indicators.

1. Introduction

Figs tree is classified as a semi-tropical tree that belongs to Moraceae and contains 800 plant species [1]. [2] mentioned that figs was originated from south part of Arab peninsula and it's still growing in wild way to spread later to South Syria and Mediterranean Beaches. The Iraqi production of figs fruits in 2019 reached (9265 tons) and average tree productivity reached (22.41 kg tree^{-1}). Saladin ranks first in productivity followed by Mosul and Wasit province. Figs fruits are used as dried and fresh fruits and juices and the milky matter (Latex) participates in the cheese industry [3]. Most active materials in figs have detergent and softening properties and considered digestion enhancers, also help to cure some intestinal diseases and chronic constipation [4]. Figs leaves contain (Methoxsalen) which is used to treat vitiligo, psoriasis and skin cancers for exposing to ultraviolet sun waves [5]. Vegetative propagation method with stem cuttings is considered as the most common and successful figs propagation in its agriculture areas to obtain homogenous and parental plant similar transplants in a short time where cuttings are usually taken from (1-3y) mature woody during dormant sap season [6]; [7]taken Woody cuttings was differs; so, cutting could be taken from younger branches (below one-year-old) for growing branches to elder branches aced several years. It is hard to determine which cutting type is more appropriate to reproduce all the plants just like figs [8]. In turn, it depends on many factors such as plant type and cuttings nutrient content just like carbohydrates and rooting helpers [9] in this field, [10] confirmed that basal cuttings have given better rooting ratio than middle and terminal cuttings for peach, apple and apricot. [11] found that basal pears cuttings of Mariana cultivar have given the highest rooting percentage of 98.33%. [12] and [13] also stated that basal woody stem cuttings of figs have significantly dominated when cultured by rooting percentage, roots

average number, heights and dry weight of roots if compared with semi-woody cuttings. In a similar study, it's been noticed that when two figs cutting types (woody and semi-woody) have been cultured, the woody cuttings have the superiority in all the studied traits just like rooting percentage [14].
Humic acid is one of the main colloidal components as it is an organic matter that results from plants and animals analysis [15]. It's just an organic chemical complex with a dark color that could either be manufactured as a liquid material or a powder. It contains (C, N, H and O) in its structure with variable ratios that cause to produce different molecularly weighed compounds [16]. Each of [17] and [18] had shown that humic acid application to soil causes raised nutrients absorption by a plant as it functions as a transporting medium for nutrients from soil to plant, enhances radical growth and sub-rooting, in addition, to increase plant protein content and increase soil useful microorganisms [19]; [20]. Humic also participates the increase of plant resistance of harsh environmental conditions such as high temperature, drought and humidity [21]; [22].

Regarding the importance of figs vegetative reproduction with stem cuttings being the best and most common way used in commercial transplants, this research aims to determine the cutting type (terminal, middle or basal) effect for figs cv Waziri on the chemical composition of the resulting transplants. Additionally, humic acid is environmentally safe and has no affection on human health and functions vitally to improve plant chemical component to obtain strong and rapidly grown transplants.

2. Materials and Methods

2.1 Trial laying out

The study was done at lathhouse of Horticulture and Landscape gardening Dept., College of Agriculture, University of Anbar, Iraq, during the growing season 2018. Cuttings have been provided on Jan 20th, 2018 from 8 years old fig trees in the early morning where the three cutting types (terminal(C1), middle (C2) and basal (C3) have been taken from single-year-old branches with (15-20cm) length. Before culturing, the cuttings bases were treated with fungicide (Binomial) at (4g.L^{-1}) concentration for (30 mins) and then dried well of fungicide to be treated next with growth regulator auxin (IBA) in (2000mg.L^{-1}) by quick embedding method for (5 secs.) to induce cuttings rooting, then to culture cuttings in plastic bags of (5 kg) capacity which contain soil mixture (3 sandy fluvial: 1 peat moss) that is stated in table 1. The culture media has been sterilized with formaldehyde in 4% concentration. Suitable ventilation has been considered in the greenhouse to eliminate excess humidity. Thereafter, cuttings were translocated to the lath house of Horticulture and Landscape gardening Department on (Apr. 1st) to avoid damage caused by the high temperature within the lathhouse. Humic acid was added to the plastic pots with 0, 2 and 4 ml.L^{-1} in three dates viz., Apr.20th, Jul. 20th and Oct. 20th. Then the chemical content of figs transplants was measured at the experiment end (Nov. 20th) to include: leaf chlorophyll content, branch carbohydrates content and leaf phosphorus, nitrogen and potassium content.

Table (1**)** some chemical and physical properties of media soil

Mg mmol.L^{-1}	Ca mmol.L^{-1}	K Av. g.Kg^{-1}	P Av. g.Kg^{-1}	N Av. g.Kg^{-1}	O.M g.Kg^{-1}	EC ds.m^{-1}	pH
37.0	43.0	21.7	17.4	2.56	2.3	1.80	7.8
Texture	Sand g.Kg^{-1}	Silt g.Kg^{-1}	Clay g.Kg^{-1}	HCO_3 mmol.L^{-1}	SO_4 mmol.L^{-1}	CO_3 mmol.L^{-1}	Na mmol.L^{-1}
Clay loam	422.4	210.0	367.6	4.0	9.6	Nil	13.1

2.2 Statistical analysis

Experiment was applied using Random complete block design with three replicates as 15 cuttings per experimental unit and so the number of used cuttings became (405) cuttings resulted from both factors interaction, replications number and cuttings number per experimental unit (3x3x15x3). Data had then been analyzed using Genstat14 program and averages were compared using the least significant difference L.S.D. on probability level 5%.

3. Results and Discussion

3.1 Leaf chlorophyll content (mg.100g^{-1} fresh weight)

Cuttings showed a significant difference in their leaf chlorophyll content where the basal cuttings (C3) showed the highest value that was 249.6 mg.100g^{-1}, followed by middle cuttings (C2) 238.6 mg.100g^{-1} while the least Leaf chlorophyll content has been found in terminal cuttings leaves (C1) That was 227.8 mg.100g^{-1},(Figure A1). The effect of humic application has reached a level of significance in affecting the studied character, especially in 4 mg L^{-1}(H3) treatment which achieved the highest of 250.1 mg.100g^{-1}, while 0 and 2 mg L^{-1}(H1 and H2) treatments gave the lowest values at (233.8 and 232.0 mg.100g^{-1}), respectively. Also, interaction treatment of mid cuttingsX4 mg L (C2H3) treatment which gave the highest Leaf chlorophyll content of 260.6 mg.100g^{-1}. While the lowest value was interaction treatment (C1H1) of 218.4 mg.100g^{-1}.

3.2 Branches percentage of carbohydrates:

Results in figure (1B) cleared that using different types of stem cuttings caused significant differences in Branches carbohydrates content in figs transplants by the dominance of middle and basal cuttings (C2 and C3) significantly to give the highest percentage that was 11.32% and 11.73%, respectively. Thus, we made a percentage of increase that respectively reached 16.10% and 20.31% from terminal cutting (C1) in which percentage reduced to the lowest level of 9.75%. Another way, humic acid fertilization has reached significant effect level in this trait by the superiority of high humic concentration 4 mg L^{-1}(H3) by giving it the highest percentage which is 12.01% to show 14.27 and 16.94% increase to both other treatments 0 and 2 mg L^{-1}(H1 and H2), respectively. While double interaction between both study factors has reached the level of significance especially in (C3H3) treatment which gave the highest level of carbohydrates that was 14.56% in time that percentage has significantly reduced to the lowest level that was 9.04% in C0H0 treatment.

3.3 Leaves nitrogen content:

Results of the statistical analysis shown in figure (1C) There is a significant difference between cutting type in leaves nitrogen content. Thus, the basal cuttings (C3) has given the highest percentage of 2.58%, followed by middle cuttings (C2) 2.47% while The least leaf nitrogen content was in terminal cutting of 2.41%. also the same figure results showed that humic treatments have a significant effect on Leaf nitrogen content by the superiority of both (H2 and H3) concentrations for being given the highest percentage that was 2.56 and 2.51%, respectively When compared with control (H1) in which percentage decreased to the least of 2.39%. Also Interaction treatments (C2H3 and C3H2) Gave the highest leaf nitrogen content of 2.67 and 2.66%, respectively. While , the interaction between control and terminal cuttings (C1H1) has shown the least percentage of 2.25% (table 1).

3.4 Leaves phosphorus content

Results of figure (1D) showed that leaves phosphorus percentage has significantly differed amongst research utilized cuttings where the highest percentage appeared in basal cuttings leaves (C3) to be 0.75%, while it's minimized in middle and terminal cuttings leaves (C2 and C1) to be respectively 0.64 and 0.63%. On the other hand, humic treatments didn't reach a significant effect on leaf phosphor content. Whereas both study factors interference as seen in (table 1) has reached significance in effect especially when humic hasn't been applied to the basal cuttings (C3H1) which showed the maximum percentage 0.84%, while the minimum one was at the non-humic application treatment to the terminal cuttings (C1H1) which was 0.52%.

3.5 Leaves potassium content

It's noticed from the statistical analysis of data shown in figure (1E) that stem cuttings (C3) have given the highest percentage of potassium in their leaves which was 1.44%, followed by middle cuttings (C2) 1.37% and the minimum percentage was in the terminal cuttings (C1) of 1.32%. While humic fertilization has reached the significance level in affecting leaf potassium content especially for treatments (H3 and H2) which gave the highest values that were 1.43 and 1.41% respectively. So, both treatments possessed a percentage of increase that is 10.00 and 8.46% successively in comparison with non-humic addition treatment (H1) in which leaves, the percentage reached the minimum level of 1.30%. The interference treatment for both study factors didn't show any significant effect to mention for potassium content in figs leaves.

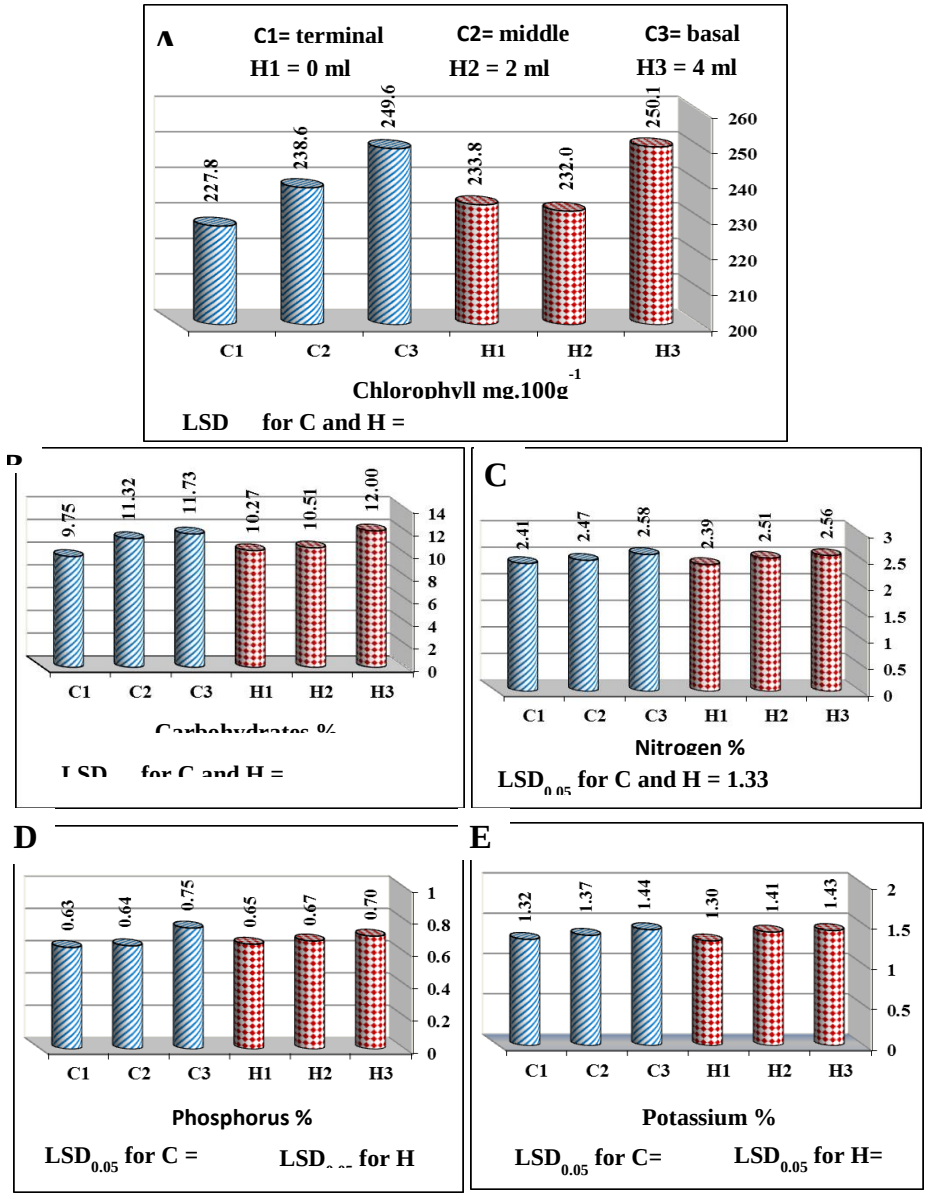

Figure (1) Effect of cutting type and humic acid in the chemical content of fig Waziri cv. Transplants

Table (2) Effect of cutting type and humic acid interaction in the chemical content of fig Waziri cv. transplants

Cutting Type	Humic ($ml.L^{-1}$)	Chlorophyll ($mg.100g^{-1}$) fresh weight	Carbohydrates (%)	N (%)	P (%)	K (%)
Terminal Cutting	0	218.4	9.04	2.25	0.52	1.25
	2	223.8	10.43	2.44	0.65	1.36
	4	241.3	9.77	2.54	0.73	1.34
Middle Cutting	0	226.7	10.34	2.32	0.60	1.31
	2	228.4	11.89	2.43	0.68	1.37
	4	260.6	11.72	2.67	0.65	1.43
Basal Cutting	0	256.3	11.43	2.60	0.84	1.34
	2	243.9	9.20	2.66	0.69	1.48
	4	248.5	14.56	2.48	0.71	1.50
$LSD_{5\%}$		18.42	2.52	0.23	0.15	N.S

The superiority of basal cuttings due to the increased content of new transplants chlorophyll, carbohydrate and macro elements (N, P and K) could be attributed to contain stored nutrients such as carbohydrate more than softy and semi-woody cuttings [9] and that carbohydrate derivatives play a vital role in rooting process especially in the early stages of cutting rooting [23]. As well as the increase of rooting enhancers just like auxin and companion factors for woody cuttings rooting could be an important reason obtaining this results [24]; [25], where auxin function to provide saccharides in sub-roots development sites due to the increased starch motion via increasing the activity of carbohydrate metabolic enzymes to release energy required for sub-root and cell mitotic enzyme formation [26]. Consequently, radicle growth was improved which positively reflected on absorbing more nutrients such as (N, P and K) which is noticed on by the increase of their percentage in transplants leaves as shown in (figure 1). These elements have great importance in all the vital processes occur inside a plant where nitrogen enhance vegetative growths and strengthening root system [27]. It's the second most major cytoplasmic component after water where its percentage is (2-4%) of plant dry matter and it's a synthetic component of essential organic compounds such as amino acids, proteins, nucleic acids (DNA & RNA), enzymes and plant hormones [28]. It's also a major component of photosynthetic chlorophyll that. Also, nitrogen acts vitally in plant auxin induction to support mitosis and cell elongation as the stems apical tops consist of high auxin concentrations that enhance cell elongation that is the stem basic elongation [29]. Potassium also acts as a sub-factor in chlorophyll and protein synthesis and making so many vital activities such as photosynthesis, carbohydrate simulation and stomata open and shut mechanism regulation to result in increased vegetative growth activity [30]. While phosphorus has an active role in meristem tissue induction, helping living cell mitosis, photosynthesis, photosynthetic product transfer and enzymatic system activation [31]. Moreover, its role in energy-rich compound synthesis that a plant requires to synthetize other compounds like carbohydrate, phospholipids and coenzymes that help activating biotic activities and thus increases plant vegetative growth [32].

About reasons of positive effect of humic addition on the chemical component of figs transplants, it is due to the role that the acid acts in growth induction via its components of organic compounds, amino acids and minerals [33]. Beside that humic acid increases cell membranes permeability for nutrients absorption [34]; [35]. Hence the increase came in leaves content of nutrients. Furthermore, the humic participates in chlorophyll formation and collecting saccharides with amino-acids and enzymes [36]. It also activates cell division, increases growth rate, improves shoot and root system and

increases dry matter in plant tissues [37]. It also gives a plant sort of resistance for different tensions to make continuity in plant vital processes [15]. Also [38] mentioned that humic acid increases the efficiency of photosynthesis, carbohydrate and protein production and reduces the amino-acid analysis because of tension; so, these effects achieved increase in all shoot and root traits. It's clear from (figure 1) results that basal cuttings and humic application have a positive effect in chlorophyll increase in leaves that encourages more carbohydrate production to activate vital activities and thus enhance all vegetative and root growth signals in transplants and absorb further nutrients from soil.

4. Conclusion

After research results explore, it's noticed that there are differences in figs transplants chemical content as a result of using different types of cuttings in agriculture and adding different levels of humic acid, especially for basal cuttings and high humic concentration through which the best results for the studied traits have appeared. So, we recommend using basal cuttings in figs culturing and humic acid fertilization to create strong shoot and root systems that support more soil nutrient absorption for better photosynthesis and more carbohydrate production for exploit in different plant vital activities.

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